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APS Moving Forward
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Apker Award Finalists Convene

Photo by Shelly Johnston

The APS Apker Award for outstanding physics research by an undergraduate is given annually in two categories: to a student from a PhD-granting institution, and to a student from an institution not granting the PhD. This year there were seven finalists from the two categories, who met in Washington in late August to be interviewed by the selection committee. They are (l to r): Adam Keith (North Carolina State University); Theodore J. Yoder (Franklin and Marshall College); Seth Whitsitt (University of Texas, Austin); Yuliya Dovzhenko (Princeton University); Matthew Ware (Illinois State University); Peter H. Jumper (University of Massachusetts, Dartmouth); and Kiaran B. Dave (University of Illinois, Urbana-Champaign). The two Apker Award recipients will be pictured in next month's *APS News*.

APS Delegation Fosters Closer Ties with China

A team of physicists representing APS traveled to China in September to enhance the Society's engagement with the Asian nation.

The delegation visited six cities in nine days, and met with dozens of physicists, professors and other leading members of the physics community in China. A second delegation representing the APS publishing offices also traveled through China shortly afterwards, overlapping briefly.

"The reason to go was to explore ways that APS can foster more international engagement with the Chinese physics community," said Kate Kirby, Executive Officer of APS. "There are already a lot of good collaborations that are taking place on an individual level."

In addition to Kirby, representatives from APS included Director of International Affairs Amy Flatten; Karsten Heeger, Chair of the APS Committee on International Scientific Affairs; and Gang Cao, a member of CISA. The editorial delegation included Manolis Antonoyiannakis, the Senior Assistant Editor of *Physical Review Letters*, and Ling Miao, Associate Editor of *Physical Review X*.

"The goal was to explore, to listen, [and] to learn what are the needs of researchers in China, and what are the opportunities for APS members," Heeger said. He added that the delegation hoped to "build connections and relations, get to know some of the researchers and universities, and explore what some of the opportunities for a scientific partnership might be."

The highlight of the trip was a joint session at the annual meeting of the Chinese Physical Society in Guangzhou. At this first-ever joint APS/CPS session, Kirby gave a talk about the APS, its mission and its activities. APS vice-President Malcolm Beasley also spoke

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APS Offers Public Outreach Mini-Grants

Again this year, APS is offering several grants up to $10,000 each to help APS members start their own outreach programs. In the past, programs such as Claymation videos, puppet shows and video games have received funding. More information about the program, descriptions of past projects and instructions for submitting proposals are online at www.aps.org/programs/outreach. Proposals are due January 11th, 2013.

Quantum Wizardry Wins Nobel Recognition

The 2012 Nobel Prize for Physics was awarded to an American and a French researcher for "ground-breaking experimental methods that enable measuring and manipulation of individual quantum systems."

David Wineland of the National Institute of Standards and Technology in Boulder, Colorado and Serge Haroche of the Collège de France in Paris are both APS Fellows. Their respective work on different quantum systems has helped to lay the groundwork for fundamentals of quantum computers and the next generation of atomic clocks.

Wineland's team developed a technique to prepare individual charged atoms in a superposition of their two lowest energy states. To do this, they confined a system of ions in an electric field and cooled them to their lowest energy state. The team then exposed the ions to a finely tuned laser pulse, which effectively created a superposition of the ground state and the next excited state.

Haroche came up with a complementary technique, which used atoms to measure the quantum state of a photon. He confined microwave photons in a specially designed optical cavity about three centimeters in size. The walls of the cavity were reflective and cooled to nearly absolute zero so the photons could bounce back and forth billions of times. The team then fired a doughnut-shaped Rydberg atom through the cavity and measured the energy shift of the atom, which they could use to reconstruct the quantum state of the trapped photons.

The subtle changes to the Rydberg atom's energy states showed that the quantum superpositions of individual photons could be detected. Moreover, physicists using this information could reconstruct the wave function of the photon as it collapsed.

"I use atoms to study the photons and he uses photons to study atoms," Haroche told the Nobel website. "So, it's really symmet-

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Preprint Policies Sow Confusion

By Brian Jacobsmeyer

For the vast majority of his scientific papers, Terry Rudolph, a quantum theorist at Imperial College, London, had no qualms about posting a preprint on the popular arXiv server. But this one was different.

This research would soon be widely considered one of the most important papers on the foundations of quantum mechanics in recent years. Rudolph submitted his team's paper to *Nature* and, with some reluctance, posted a preprint of it to the arXiv.

This paper never appeared in *Nature*, however. In a highly unusual case, *Nature* rejected the paper at a late editorial stage after Rudolph and a co-author, Jonathan Barrett of the University of London, posted a surprising follow-up article to the arXiv. In a post on the popular Cosmic Variance physics blog, Rudolph publicly contested *Nature*'s decision, blaming it in part on the scientific "buzz" surrounding his preprints.

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Buckley Prize Receives Major Donation from Taiwanese Company

The HTC-VIA Group of Taiwan has made a donation of $140,000 to support and enhance APS's Oliver E. Buckley Condensed Matter Prize. The Buckley Prize is the oldest APS prize, and one of the most prestigious.

The award is given to researchers who have made significant contributions to the field of condensed matter physics. Until this year, the stipend of the prize had been $10,000, but with the new donation, it will double to $20,000 for the next seven years.

The donation was made possible by Cher Wang, the founder and chair of HTC and VIA Technologies, and her husband Wenchi Chen, CEO of VIA technologies.

"The American Physical Society is thrilled with the generosity of Cher Wang and Wenchi Chen in reinvigorating the Buckley Prize, enabling the award amount to double," said Sam Bader of Argonne National Laboratory, former chair of the Division of Condensed Matter Physics. "The Buckley Prize is a premier prize of the APS. Over the years its ranks have included as many as sixteen who also became Nobel Prize winners."

Professor Nai-Chang Yeh of Caltech first reached out to the couple, who are ranked by Forbes as amongst the top ten richest people in Taiwan. VIA Technologies is a major integrated circuit and computer chip manufacturer, while HTC manufactures smartphones and tablet computers.

"They very much appreciate the high status of the recipients who have received this prize, and more so that it is very much in line with what their company does," said Darlene Logan, APS director of development.

The prize was established in 1952 by AT&T Bell Labs in honor of their president, Oliver E. Buckley, who had retired the previous year. With the new donation, the HTC-VIA Group will also be named as the official co-sponsor of the award. Also, in recognition of their contribution, Wang and Chen have been invited to travel to the APS March Meeting in Baltimore.

"They will be invited to come and present the prize with the APS President," Logan said.

Of Historical Significance

Photo by Liz Dart Caron

Roger H. Stuewer of the University of Minnesota (center) is the 2013 recipient of the APS Abraham Pais Prize in History of Physics. In the photo he receives congratulations from two members of the selection committee, *Physics Today* editor emerita Gloria Lubkin (left), who is vice-Chair of the committee, and Gregory Good, Director of the Center for History of Physics of the American Institute of Physics, who is AIP's representative on the committee. The announcement of Stuewer's selection as the Prize recipient took place on September 24, at the 50th anniversary celebration of AIP's history programs, commemorating the dedication, in September of 1962, of the Niels Bohr Library and Archives by J. Robert Oppenheimer.

Members in the Media

"If we can just damage that part selectively–without hurting the brain or another part of the body to get there–that's a big deal."

***Gabe Spaulding**, Illinois Wesleyan University, on his work developing cancer treatments,* The San Francisco Chronicle*, September 23, 2012.*

"The idea of creating a crystal with dimensions higher than that of conventional 3D crystals is an important conceptual breakthrough in physics, and it is very exciting for us to be the first to devise a way to realize a space-time crystal."

***Tongcang Li,** Lawrence Berkeley National Lab, on using a four-dimensional crystal as the basis of an eternal clock,* FoxNews.com, *September 25, 2012.*

"There had been bombs dropped on cities. There had been firestorms, and so forth. I believe people nowadays don't realize that in war your objective is to beat the enemy. And unfortunately, mostly that involves killing a lot of the enemy to do that. So war is a very bloody thing… I felt then that although this was a terrible event, it probably saved many, many more Japanese lives. They probably would have lost millions if they had had to defend themselves against an invasion."

***Robert Christy**, Caltech, from a 1994 interview reflecting on his work during the Manhattan Project,* The Chicago Sun-Times*, October 5, 2012.*

"The potential immediate benefit for cancer detection greatly outweighed the potential for cancer from the radiation that would occur many, many years down the road."

***Robert Ochs,** University of Toledo, on the safety of mammograms,* The Washington Post*, October 8, 2012.*

"There are ways to stretch the rules, but evidently the relevant decision-makers felt that there was not sufficient reason to do so in this case."

***Frank Wilczek,** MIT, on why he thought the Nobel Committee didn't award the Physics prize to the researchers who postulated the Higgs Boson,* NBC.com*, October 10, 2012.*

"What physicists don't know is that they are studying Picasso's paint."

***Volker Rose**, Argonne National Laboratory, on how the same zinc oxide Pablo Picasso used in his paints is now being studied for technological applications,* The Chicago Tribune*, October 10, 2012.*

"Dave is universally acknowledged to be one of the true nice guys in physics, which is not something that can always be said about Nobel laureates… His unassuming and humble style are entirely unique."

***Christopher Monroe,** University of Maryland, on Nobel laureate David Wineland,* The Washington Post*, October 10, 2012.*

"I attribute essentially all my success to the very large amount of chocolate that I consume… Personally I feel that milk chocolate makes you stupid… Now dark chocolate is the way to go. It's one thing if you want like a medicine or chemistry Nobel Prize, OK, but if you want a physics Nobel Prize it pretty much has got to be dark chocolate."

***Eric Cornell,** University of Colorado,* The Chicago Tribune*, October 10, 2012.*

"At this point, I wouldn't recommend anyone buy stock in a quantum computing company… but we're optimistic that as the technology improves over the years, this quantum computer will bring unique capabilities to computing."

***David Wineland,** NIST, on the future of quantum computing, commenting on winning a share of the Nobel Prize,* The Denver Post*, October 10, 2012.*

"We're both scared… Kenny's probably scared 'cause he could die… I'm just scared that I'll embarrass myself."

***Adam Riess,** Johns Hopkins University, at a symposium on exploration comparing his kind of exploration to Kenny Broad, an underwater cave spelunker,* NationalGeographic.com*, October 12, 2012.*

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This Month in Physics History

October 1777: Discovery of Lichtenberg Figures

Victims struck by lightning often develop red, branching patterns across their skin, often lasting several days, likely caused by delicate capillaries under the skin rupturing from the shock of the electrical discharge–a natural example of fractals. The colloquial name is "lightning flowers," but they are also called "Lichtenberg figures" in honor of 18th century physicist Georg Christoph Lichtenberg.

Born in 1742 to a pastor in Darmstadt, Germany, Lichtenberg was the youngest of seventeen children, and evinced a natural curiosity and penchant for math and science at an early age. Initially his family could not afford to pay for his education, but a grant from a generously minded aristocratic patron enabled the boy to attend Göttingen University. Eventually he became a professor of physics there, a job he held for the rest of his life.

Georg Christoph Lichtenberg

Lichtenberg cut an interesting figure: a spinal deformation left him hunchbacked, a condition that caused serious difficulties with his breathing in his later years. But he enjoyed an excellent reputation as a satirist as well as a scientist, and was wildly popular with women, enjoying several romances before marrying one Margarethe Kellner, who bore him six children.

Today Lichtenberg's literary reputation is most closely associated with his aphorisms, collected over many years in personal journals he called "waste books" (Sudelbücher). In these waste books, he jotted down random facts, observations on human nature, short sketches from his life, even his current bedside reading material, along with scientific notes from his many experiments.

This was an era when scientists across the Western world were fascinated by electricity–or, as they termed it, "electric fluid," with many engaging in experiments to study charged objects and how sparks jumped between them, using all manner of apparatus, including Leyden jars and electricity tubes. Benjamin Franklin was one of them, proposing his famous experiment with an elevated "lightning rod" or wire to "draw down the electric fire" from a storm cloud, with the experimenter standing in the protection of an enclosure similar to a soldier's sentry box. At least one scientist (Georg Wilhelm Reichmann) died in the attempt to replicate Franklin's experiment, due to an unfortunate encounter with ball lightning.

Lichtenberg's enthusiasm for the electric fire remained undiminished by such tragic accidents. He was among the first to bring Franklin's lightning rods to Germany, installing several around his home in Göttingen, and was an early adopter of using apparatus in his own lab experiments. He constructed a large electrostatic generator, known as an electrophorus, measuring six feet in diameter, and used that to study the behavior of the electric fire–including figuring out how to record the branching patterns left in the wake of electrical discharges.

First he used the electrophorus to administer a high voltage charge to an insulating material, such as resin, glass or hard rubber. Then he sprinkled the material's surface with a mix of powdered sulfur, red lead and lead tetroxide and watched the patterns form, before pressing a piece of paper onto the surface to transfer those images to the paper. Lichtenberg noted two distinctive types of patterns: one for a positive charge, which had longer, more elaborate branching, and the other for a negative charge, which more closely resembled a shell. His conclusions were published in his 1777 memoir, *Super Nova Methodo Naturam ac Motum Fluidi Electrici Investigandi*.

The fundamental principles underlying Lichtenberg's experiments set the stage for modern plasma physics research. In the 1920s, Arthur von Hippel and others recorded light from high voltage electrical discharges onto photographic film. Von Hippel reasoned that the unique Lichtenberg patterns resulted from interactions between the ionized gas and the dielectric surface of the material, and discovered he could change the length of the branching pattern simply by increasing the applied voltage or reducing the surrounding air pressure.

That, in turn, led to the invention of klydonographs, instruments to record the high voltage discharges and polarity of unusual power surges, such as when lighting strikes a power line. Access to such data enabled engineers designing power grid systems to find effective protective countermeasures against lighting strikes and similar unplanned surges.

Lichtenberg's experiments also provided the basis for to the invention of the Xerox machine, thanks to Chester Carlson's kitchen experiments in his Queens apartment in the 1930s. Carlson called it "electrophotography." His theory was that if the image of an original photograph or document were projected onto a photoconductive surface, current would only flow in the areas that light hit upon, and not in the areas of darkness, i.e., the print. He figured out how to get dry particles to stick to a charged plate in a pattern corresponding to an image shining on the plate. Then he transferred those powder images to wax paper, heating the sheets to melt the wax for a permanent copy.

In the 1940s, Arno Brasch and Fritz Lange were working with one of the first particle accelerators (they called it a "Capacitron") at AEG

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Education Corner

A column on educational programs and publications

APS Bridge Program receives NSF Support

As reported in the October *APS News*, the NSF recently awarded APS $3 million in funding over the next five years to launch the APS Bridge Program, a national program designed to increase the number of underrepresented minority students who receive doctoral degrees in physics. The program requests proposals for new bridge sites to develop proposals for such projects. Initial proposals are due November 16th. More information is available at www.APSBridgeProgram.org

Deadline Approaching for the APS Conferences for Undergraduate Women in Physics

November 15 is the last day to apply for the APS Conferences for Undergraduate Women in Physics. Learn more about the conferences and find the closest one to you at www.aps.org/programs/women/workshops/cuwip.cfm

New Effective Practices in Teacher Education: Call for Proposals

The Physics Teacher Education Coalition, the APS, and the American Association of Physics Teachers announce a call for manuscript proposals for a new peer-reviewed book entitled *Effective Practices in Preservice Physics Teacher Education: Recruitment, Retention, and Preparation*. This book seeks to provide a practical guide to innovative, state-of-the-art programs, and will include papers and case studies covering a wide variety of topics in preservice teacher education. Manuscript proposals are due February 1, 2013. More information can found at: http://www.ptec.org/effectivepracticesbook.cfm

Minority Scholarship Application Process Begins

The APS is once again pleased to announce its Scholarships for Minority Undergraduate Physics Majors. African American, Hispanic American, and Native American students who are college freshmen or sophomore physics majors, and who are US citizens or permanent residents are invited to apply. The online application deadline is February 4, 2013. Awards are $2000 and $3000 per academic year. More information can be found at http://www.aps.org/programs/minorities/honors/scholarship/index.cfm

2012 Professional Skills Development Workshops for Women

The APS, with support from NSF, will host in 2013 two Professional Skills Development Workshops for female physicists. Postdoctoral associates and early-career faculty and scientists are invited to apply for the March 17, 2013 workshop in Baltimore, MD. Postdoctoral associates and senior-level faculty and scientists are invited to apply for the April 12, 2013 workshop in Denver, CO. Senior graduate students are also welcome to apply.

Applicants affiliated with a US institution/facility are eligible for travel and lodging funding consideration. Those needing funding assistance are encouraged to apply early. The deadlines for the workshops and a link to the online application can be found at: www.aps.org/programs/women/workshops/skills/

Registration Open for 2013 PhysTEC Conference

The 2013 PhysTEC conference will be held March 16-17, 2013 in Baltimore, MD, immediately preceding the APS March Meeting. For information on the 2013 PhysTEC conference, visit www.ptec.org/conferences/2013/

Childcare Grants for APS Spring Meeting Attendees

Grants of up to $400 are available for APS March and April Meeting attendees who are bringing small children or who incur extra expenses in leaving them at home (e.g., extra daycare or babysitting services). The deadlines for the grants and a link to the online application can be found at: www.aps.org/programs/women/workshops/childcare.cfm

Funding for Undergraduates to Attend APS Meetings

A limited number of $200 and $1000 travel supplements are available for undergraduate students presenting at the 2013 APS March and April meetings. Students must submit their abstracts by the meeting deadlines, which are November 9, 2012 for the March Meeting, and January 11, 2013 for the April Meeting. Students will also be invited to take part in Future of Physics Days (FPD), which include special events that are planned over the course of the meetings to enable undergraduates to meet their peers, share their research results with other physicists, and begin building a network among fellow physicists. A description of the program and awards, including eligibility requirements are coming soon on the FPD website: http://www.aps.org/programs/education/undergrad/students/futurephysics/

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"Quantum physics is one of the hardest things to understand intuitively, because essentially the whole point is that our classical picture is wrong… The world is not made up of particles and waves and beams of light with a definite existence. Instead, the world works in a much more exploratory way. It is aware of all the possibilities at once and trying them out all the time. That is a hard thing to picture."

Neil Turok, *Perimeter Institute for Theoretical Physics,* The Globe and Mail, *October 12, 2012.*

INSIDE THE BELTWAY

Lame, Lamer, Lamest

by Michael S. Lubell, APS Director of Public Affairs

About the only people who relish a lame duck are hunters in their blinds and Washington columnists. But never having worn camouflage or fired buckshot at forsaken fowl, I can't relate to the bird stalkers.

Washington columnists, on the other hand, are part of a breed I understand well. And when Congress reconvenes on November 13 in a post-election lame duck session, I know their juices will begin to gush.

It wasn't too many years ago that Congress actually tried to get most of its work done before the first Potomac cold snap. No more! Around Washington, temperatures began to dip below freezing in mid-October, but members of Congress had bolted weeks earlier, leaving all the burning legislative issues on a cold Capitol Hill cooktop.

When they return from their hometown turf on November 13, they will face a plethora of daunting decisions: extending the Bush era tax cuts (or not), raising the debt ceiling ("not" is not an option, except for Tea Partisans), addressing the "doc fix"–a perennial Medicare sore–putting another patch on the alternative minimum tax and trying to avoid the sequestrations mandated by the 2011 Budget Control Act–a problem that no one envisioned a year ago but that now epitomizes the odious outcome of Washington's dysfunction.

About the only major issue members of Congress won't have to deal with is the fiscal year 2013 budget. It's off the table, not because they completed their work, but because they kicked their principal responsibility down the legislative road until next March. Before they went on the lam at the end of September, they passed a Continuing Resolution that keeps the dysfunction functioning, at least for now.

Having ducked their duties for more than a year, will it be possible for the lame duckers to deliver anything more than more temporary palliatives? It's unlikely, but miracles do occur once in a long while.

Just ask Paul Broun (R-GA 10th), a medical doctor and a member of the House Science Committee, who last month called evolution, embryology and the Big Bang theory "lies straight from the pit of hell." Speaking at the Liberty Baptist Church Sportsman's banquet in Hartwell, Georgia, Broun opined, "You see, there are a lot of scientific data that I've found as a scientist that actually show that this is a really young Earth. I don't believe that the Earth is but 9,000 years old. I believe it was created in six days, as we know them. That's what the Bible says."

If Moses parted the Red Sea, and Jesus walked on the waters of Galilee, miracles surely can happen on the banks of the Potomac. But, in the upcoming lame duck session, unfortunately, a miracle is not very likely. The lame ducks are more liable to be lamer than usual. Here's why.

For months, Wall Street and financial titans around the world have been warning of another global recession if Washington marches off a fiscal cliff by ignoring all the daunting tax and spending issues. But more recently, policy makers and economic analysts have said the cliff is really more like a slope. Chad Stone, chief economist of the non-partisan Center on Budget and Policy Priorities, for example, recently wrote, "A relatively brief implementation of the tax and spending changes required by current law should cause little short-term damage to the economy as a whole."

That's probably enough impetus for the 112th Congress to finish out its term with just a whimper and cede to its successor the chore of cleaning up the lingering fiscal mess, after the 113th Congress convenes next January 3.

If Chad Stone is correct, the world economy won't die of suffocation, but American science could well be left wheezing. Federal agencies are already taking a conservative approach and are withholding funding for many activities until the new Congress decides which programs should be permitted to blossom and which should be allowed to wither.

Stone's analysis notwithstanding, many economists argue that business cannot thrive in an atmosphere of continuing uncertainty and that even a fiscal slope could precipitate another recession.

If they were sufficiently science savvy, they would make the same pronouncements about the damage uncertainty can wreak on research. But most of them aren't.

So scientists will have to take some valuable time away from their laboratories to explain how a continuing resolution will thwart new ventures and how an eight percent sequestration will seriously damage discovery and innovation. They must begin making the case to elected officials now.

But they must also begin engaging the general public. As polling has shown, apart from medicine, most Americans know little about the benefits science delivers. It's time to start enlightening them. Not finding time to do so is the lamest of excuses.

Mid-Atlantic Section Helps APS Cover the Map

There are currently nine APS Sections, organized geographically across most of the United States, and even into parts of Canada. This Fall, a tenth APS Section will make its debut, covering the last unincorporated region, along the Eastern Seaboard. The Mid-Atlantic Section will include five states plus the District of Columbia, a region which encompasses approximately 11 percent of APS members.

The new section will be for physicists based in New Jersey, Delaware, Maryland and Washington DC, as well as most of Pennsylvania and West Virginia. The region is home to numerous different scientific institutions including major research universities, small liberal arts colleges, a national military academy, the headquarters of dozens of scientific and professional societies, the National Academies, numerous government laboratories and government agencies.

The APS Council is slated to vote on the proposed section's bylaws at their November 3 meeting. If the bylaws are passed, the section needs 200 members to officially join to become a full-fledged active section. At press time, Council had not yet voted, but passage of the bylaws is expected.

Stephan Schlamminger of NIST spearheaded the effort to set up the new section. He said that after he moved to Maryland from the University of Washington, he missed the networking opportunities the Northwest Section offered, as well as the chance to catch up on different sub-fields in physics at the sectional meetings.

"You don't see the broad perspective," Schlamminger said. "I really miss that here."

Schlamminger first remarked on the lack of a Mid-Atlantic Section to Beverly Berger, a former chair of physics at Michigan's Oakland University and NSF program officer. She advised him to do something about it and put him in touch with Charles Clark of NIST and the University of Maryland. Clark helped pull people together in the region to find interim officers while the group sets up and is now Chair of the Nominating Committee. Schlamminger also contacted APS Director of Mem-

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Letters

Readers interested in submitting a letter to APS News ***should email letters@aps.org***

New Coordinates for DPF Community Summer Study

We thank Alexander Abashian for his thoughtful letter in the July 2012 *APS News.* The Community Summer Study of the APS Division of Particles and Fields, mentioned in the Editor's Note, will now take place at the University of Minnesota from July 29 through August 6, 2013. See http://www.snowmass2013.org for details.

Ed. Note: *This correction was submitted by the officers of the APS Division of Particles and Fields: Pierre Ramond (Chair); Jonathan L. Rosner (Chair-elect); Ian Shipsey (vice-Chair); and Patricia McBride (past Chair).*

Peer Review Stifles Originality

The gathering clouds on print v. open access (*APS News*, October 2012) may presage a publishing Roe v. Wade war in which the printers seem to fear that established science might become tainted by a surfeit of free thought, some of which may actually be correct. My personal experience with peer review is that every paper which I would rather not be out there now, every paper which was trivial or even wrong, sailed through peer review with flying colors. On the other hand the papers of which I am proudest and believe to be the most substantial were the most at risk for being rejected. My paper on chiral-molecule photoelectron angular distributions, published in *Physical Review A* in 1976, would have been rejected had not an editor sent it to my former postdoctoral advisor, who gave it to a current postdoctoral fellow to check the mathematics. How rare an event do you think this is, which would not have happened had I been ten years or more beyond my degree and absolutely would not have happened today? Single-blind peer review is manifestly flawed. It is a kind of chat room, in which participation requires that you be on topic and say things that everyone else will agree with. This is not hard for most, given the homogeneity of the education system. The peer-review and publishing system persuades you to stay close to the work of your advisors, to be gathered to your fathers (to use an archaic expression), which may be close to the mark because indeed the system stifles independence and creativity. And then there is the emergence of an odd duck of an editor called an "administrative editor," who seems to be a sort of journal commissar to ensure that the journal's impact factor is maintained or improved. This is a misguided journal orientation which will surely filter out most or all original work.

Burke Ritchie
Livermore, CA

Communication can be Counterproductive

Got science?

Carl Safina, a man of many awards, exhorts scientists, in the *APS News* October Back Page, to bestow their superior wisdom on the benighted masses of this world. Not, to be sure, for filthy lucre, but out of the pure love of Truth, which is its own reward. Nevertheless, as a result of this effort, unrequited utopias will rise out of the warming surface of the Earth and, blinded by the Light, politicians will rain dollars on the blessed and the PhD's. Maybe even on the MS's.

Please don't! Please don't "communicate" with the innocent. No matter how simple and straightforward and fact-filled your argument is that cell phones don't cause brain tumors or that nuclear power is safe, the Internet has provided everyone not only with their own opinions but, pace Moynihan, also with their own facts. There is a study from England or Sweden or Canada proving just about anything. It will not be your argument that is rejected, but its origin in the aura of prestige that surrounds any successful scientist. It is not your argument, but the fact that you, a figure of authority, are arguing at all, that will cause your public to perceive you as a threat.

Furthermore, scientists outside their narrow field of specialization tend to be naifs. They often are insufficiently informed and will inevitably try to reinvent the wheel. This would be laughable if it were not taken seriously but, coming from a certified expert, it can be downright dangerous. Heisenberg joined the Nazi efforts to develop an atomic bomb and his latter-day colleagues in Iran are happily working on the development of nuclear weapons to serve their country's genocidal objectives. Sakharov fathered the Soviet hydrogen bomb before he got religion and became a dissident. Oppenheimer was easily manipulated by Haakon Chevalier and ensnared by Buddhist mysticism. Philby, MacLean, Burgess and Blunt spied for the Soviet Union out of idealism. Linus Pauling developed vitamin C into a cult. Even the giants of physics, Newton and Einstein, did not always have "something special to share." Newton delved into astrology when he was done with mechanics; when Einstein was asked to become the first president of Israel, the people who asked him had to worry about a worst-case scenario: that he might accept.

There is an awful lot more to the workings of religion, law, politics and business than "just fooling around." Regardless of the average temperature of the surface of the Earth, or the model-dependent estimates of the human contribution to it, basic thermodynamics tells us that organisms requiring energy to stay alive will inevitably warm their environment. The scientific solution is obviously to eliminate people. Now there's "something special to share." Try communicating that to your neighbors.

The unavoidable reality is that, no matter how deeply you, as a scientist, understand the acoustical and mechanical properties of a violin, it does not qualify you either as a violinist or as a composer. Or even as a music critic.

Walter Schimmerling
Washington, DC

Need to Bring All Vocations to the Same Table

Carl Safina's Back Page commentary literally took my breath away. In the process of answering the question, "Why Communicate Science?" he claimed our work as physicists to be of such singular value that by comparison the work of lawyers, politicians, and business people was just "so much fooling around." That Safina would so dismiss the vocations of those we need to most communicate with demonstrates more clearly than ever the problem we scientists have communicating with anyone outside our immediate purview.

Rather than dismissing the vocations of law, politics and business, we ought to engage them for the skills they bring to the table of our mutual concerns. Most important is the skill of making significant and difficult decisions based on the naturally occurring variety of opinion that exists in much of their work. Such work is necessarily subjective, and dismissing it as less than the objective work of the scientist is simply mistaken.

Bringing all vocations to the same table requires the proper consideration of what we know, even if what we know is uncertain. Better than arguing over who is correct is to accept the subjectivity of our knowledge and to proceed from there. Here Bayesian thinking simply works better than arguing over who is right or wrong as we focus not so much on where we are in the scheme of things, but on how far have we come.

Consider global climate change. We now know that even pre-schoolers left to their own devices make observations based on the accumulation of previous experience that allow them to make accurate predictions based on less than complete data. I suspect if children can do this, we can all do it and thus bridge our differences as we look at problems such as understanding global climate change. Only by getting all of us on the same page can we begin to address today's most pressing problems.

David A. Robinson
St. Paul, MN

Carl Safina Responds:

In "Why Communicate Science?" I wrote that I believe most scientists should seek ways to make science more familiar to people outside of science. I wrote, "By 'communicate science,' I mean professional scientists explaining something about science to non-scientists," because scientists, "have something pretty special to share." A modest enough proposal, I think; a bit of cheerleading for the value of science.

Walter Schimmerling disagrees. In his first paragraph is a straw-man caricature, which contains none of what I said, except that yes, I guess I did imply that love of truth is its own reward. I infer that Schimmerling doesn't feel that. I do.

In the next paragraph, he says, *inter alia*, please don't communicate because the Internet exists. Lots of people get confused by conflicting information on the Internet. So, scientists, no reason to help anyone sort anything out, just because you happen to be an expert in your area. Need I comment?

Third paragraph. Scientists tend to be naïve, "and will inevitably try to reinvent the wheel." Historically, "reinventing the wheel" included developing the first nuclear weapons, and being approached by people seeking their involvement in Cold War espionage and politics. The point?

Next paragraph. He chides me for an admittedly simplistic bit of hyperbole, and notes that, "There is an awful lot more to the workings of religion, law, politics and business than 'just fooling around.'" One should not be simplistic, I must agree. He follows with, "basic thermodynamics tells us that organisms requiring energy to stay alive will inevitably warm their environment. The scientific solution is obviously to eliminate people." One should not be simplistic, I must agree.

Schimmerling's final point is the only one I can follow. He says, "no matter how deeply you, as a scientist, understand the acoustical and mechanical properties of a violin, it does not qualify you either as a violinist or as a composer. Or even as a music critic." This is true, but beside the point. My little essay implies merely that you, as a scientist, could add something that no amount of playing, listening, or loving music could conjure. You could help the musician and the music lover understand the music that so moves them. Why does the same note sound different on a violin, a piano, a horn? Musicians call that difference timbre, but only science could have found out that timbre is the result of the shape of the sound waves each instrument characteristically creates. I'm pretty sure some violinists would be interested in knowing that. That's a beautiful thing. And yes, I think that's pretty special.

David Robinson also objects to my simplistic dismissiveness of law, politics, and business. It's a valid objection. But law, politics, and business–and I think we can include religion nowadays–are, as far as I can tell, not designed to discover how nature works, nor how the physical and biological world functions, nor where we came from. Nor are they trying to get at objective truths. That's a big difference. And my point was less to dismiss those vocations (hence my simplistic dismissal) than to remind scientists that science is very special, and unlike anything else. And while law, politics, and business are potentially noble things, they frequently pursue ignoble ends and narrow interests. That is partly because, as Mr. Robinson points out, their work is inherently subjective. Again, my aim was not to analyze those professions or their vulnerabilities, but to draw a distinction between the subjective ideologies and profit motives driving other endeavors and the main thing that makes science special, which is, indeed, its demand for evidence and its ideal of objectivity in its continuing search for truths. That should make scientists proud and excited to talk about what we do, and why we do it.

Ig Nobel Research is Serious, After All

By Michael Lucibella

APS journals were big winners at this year's Ig Nobel prize ceremony, held in late September in Cambridge, Massachusetts. Both the Physics Prize and the Fluid Dynamics Prize were presented for research that was first published in the *Physical Review*.

According to their founder, Marc Abrahams, the annual Ig Nobel prizes are awarded to research that "makes people laugh, then makes them think." They're given to scientists whose scientific publications on the surface might sound silly or even frivolous, but have meaningful science behind them.

For instance, characterizing the physics of ponytails was first published in February's *Physical Review Letters*. The authors of the paper, titled "Shape of a Ponytail and the Statistical Physics of Hair Fiber Bundles," developed an equation to predict the shape of almost any configuration of hair sticking out of the back of one's head.

"We set ourselves the task of trying to understand the balance between the elasticity of filaments, their weight and the curvatures, the random curliness that gives the volume to hair," said co-author Raymond Goldstein of the University of Cambridge. "Hair has a characteristic stiffness and mass per unit length which together with gravity, define a length scale over which gravity will bend them."

Less than two inches, and the hair will stick straight out, largely unaffected by gravity. Longer than those two inches, and the hairdo will bend under its own weight. The team dubbed the ratio of a person's actual length of hair, to those two critical first two inches the "Rapunzel Number," after the fairytale damsel in distress. The larger the number, the bigger effect gravity has on the hair.

"Physics is all about understanding real world phenomena from a small set of fundamental principles," said co-author Robin Ball of the University of Warwick. "Our understanding of the bending of a hair fiber is just the same as our understanding of the elastic bending of beams in civil engineering." He added that strands of hair are also akin to the long molecules of polymers, so understanding how hair behaves carries over into the microscopic world.

Also ripped from the pages of the *Physical Review* is Rouslan Krechetnikov and Hans Mayer's research into the fluid dynamics of a cup of coffee. Their paper, "Walking with coffee: Why does it spill?" was first published in *Physical Review E* in April.

As it turns out, the period of oscillation for coffee in a standard mug is almost exactly the same as the length of time for a person to take a step. When someone carrying a cup of joe takes a step, the coffee sloshes forward then back again. By the time the liquid flows forward a second time, the person has taken a second step adding to the forward momentum of the drink. The sloshing keeps intensifying until finally the coffee crests over the lip of the cup, and spills onto the ground.

"In general this problem is a confluence of several subjects, namely fluid dynamics, dynamical systems, biomechanics and behavioral dynamics," Krechetnikov said. He added a word of warning to espresso drinkers. The oscillation frequencies of tiny espresso cups are even closer to a person's average stride, making it even more likely for one's drink to spill.

His investigation into the physics of coffee stems from research into other, more serious, areas of fluid dynamics, such as aerodynamics, hydrodynamics and geophysics.

"We need to understand the underlying physics and also to develop the theoretical foundation," Krechetnikov said. "Walking with coffee is just one of the examples of such kinds of systems."

Other winners at this year's ceremony include the Medical Prize for research into preventing colonic gas explosions during colonoscopies, the Peace Prize for a company that converts obsolete Russian Munitions into nanodiamonds, and the neuroscience prize for a team of researchers who discovered that due to improperly corrected statistical errors in FMRI scan data, they were able to detect active brainwaves in a dead fish.

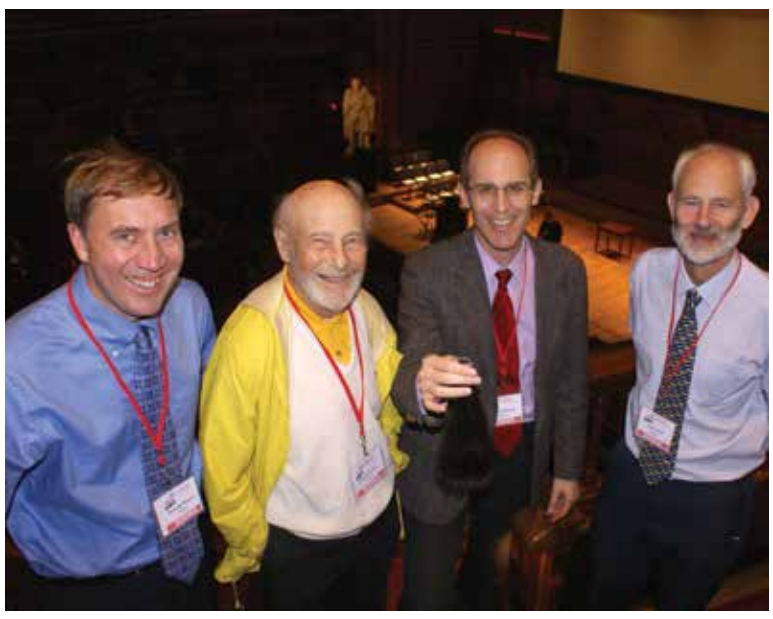

Photo by Michael Lucibella

The winners of the 2012 Ig Nobel physics prize (from left to right) Patrick Warren, Joseph Keller, Raymond Goldstein and Robin Ball deduced the mix of forces acting on a human pony tail.

NOBEL continued from page 1

rical and, at some point during our work, we published papers back-to-back. Just by chance, it happened that we are doing similar things on his atoms and my photons."

The ion traps invented by Wineland have become important tools for developing applications He has already used the traps to develop "optical" atomic clocks one hundred times more accurate than the current "cesium standard" used today. Other researchers have taken the accuracy afforded by an optical clock and used it to detect the subtle variation in the flow of time caused by the different pull of gravity at two points a foot apart in altitude.

Ion traps have also been turned into the fundamental processing units of a future quantum computer. Each quantum bit of information, instead of only being either a 1 or a 0, can be both simultaneously, increasing the processing power over conventional computers by an exponential amount. In July of 1995, Wineland and his team were the first to demonstrate a simple logic gate using these qubits, effectively the first basic computation using a quantum processor.

Wineland, who was sleeping when he first received the call from Stockholm at four in the morning, said that it was a "wonderful surprise" to win the award.

"It's always been great [and] really exciting to be in this field," Wineland told the Nobel website shortly after he received the news.

Wineland previously was awarded the APS Davisson-Germer Prize in Atomic or Surface Physics in 1990, and the 2001 Arthur L. Schawlow Prize in Laser Science. Haroche was APS's Beller lecturer at the 1996 DAMOP meeting, an honor which brings distinguished international physicists to speak at APS meetings. APS president Robert Byer commended the two winners of the prize.

"Haroche and Wineland have both done beautiful research vital to the technology that truly makes this the century of the quantum," Byer said. "Modern telecommunications rely on quantum technology, and things like the GPS system so many people use on a daily basis wouldn't be possible without ultra-precise clocks that exploit quantum effects of the type they explored. Someday, computers built with quantum mechanical systems, much like those in the labs of Haroche and Wineland, may solve problems far beyond the capabilities of even the most advanced of today's computers. It's certainly amazing work these physicists have done, and continue to do, and well worth the Nobel committee's recognition."

Two Plaques are Better than One

Photo credits: courtesy of SLAC National Accelerator Laboratory (upper); Nina Maksimova (lower).

APS recently presented two plaques as part of its Historic Sites initiative. In August, APS past President Barry Barish (left in top photo) presented a plaque to SLAC National Accelerator Laboratory in recognition of the achievements of the Stanford Linear Accelerator and the SPEAR electron storage ring. The plaque was accepted by laboratory Director Persis Drell (right).

In October, APS Treasurer/Publisher Joseph Serene, a Dartmouth alumnus, presented a plaque recognizing the Wilder Laboratory at Dartmouth as the site of the celebrated Nichols-Hull pressure of light experiments in 1900-1903. In the lower photo, Serene (right) unveils the plaque with the help of Martin Wybourne, Provost and Francis and Mildred Sears Professor of Physics.

APS physics MOVING FORWARD

APS STRATEGIC PLAN UPDATE

Last spring, after more than a year of work on the part of leadership, volunteers, and staff, APS unveiled its new five-year strategic plan. This column, which will appear in *APS News* at frequent intervals, is intended to update members on progress in implementing the plan. The first installment, below, deals with the early activities of two new task forces. For the complete text of the strategic plan, please see http://www.aps.org/about/strategy/upload/strategicplan.pdf

Development Task Force Holds First Meeting

A key area of concentration in the strategic plan is to "undertake efforts to build a comprehensive Development strategy" so as to help assure the future financial stability of APS. In pursuing this objective, a Development Task Force has been formed to provide recommendations to the APS Board on optimal Development Office operations and future fundraising opportunities. Current APS vice-President Malcolm Beasley chairs this Task Force and has recruited a galaxy of academic, industrial and science administration leaders who have experience in successful fundraising. Task Force members include: Robert Birgeneau, Chancellor, University of California, Berkeley; James Bray, GE Global Research; Cherry Murray, Dean, School of Engineering and Applied Sciences, Harvard University; and Ray Orbach, Director, Energy Institute, University of Texas, Austin. Also Gary Bjorklund, a physicist and investor formerly at Bell Labs and IBM Research Labs, has agreed to serve as a consultant to the Task Force.

In the past, APS has been grateful for generous support from government agencies and labs, corporations, foundations and individual members of the Society. But as noted by Beasley, "The climate and approaches to development are changing rapidly, and I am pleased to have such a strong group of APS members to help us consider these issues". The Task Force will be exploring current trends and specific issues relevant to APS Development. These include the political funding environment, diminished number of corporate research labs, decreased top physics leadership in large corporations, proliferation of smaller-scale entrepreneurial companies, expectations of younger hands-on donors, the use of social media in the fund raising environment, opportunities as a result of the nation's focus on STEM initiatives, and operational needs in launching the next major campaign for APS.

The Task Force held its first meeting in Chicago on August 29, 2012. Extended discussion took place on the issues mentioned above and further informational needs and action items were identified. Several additional meetings will take place before the Development Task Force provides its recommendations to the APS

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LICHTENBERG continued from page 2

in Germany, capable of producing high-voltage electron beams that left bluish flame-like tails of ionized air in their wake. Brasch and Lang were the first to inject free electrons into cubes of plastic, and the resulting electrical breakdown captured the branching pattern of Lichtenberg figures perfectly in three dimensions. Today, the Dynamitron at Kent State's Neo Beam facility does similar work, and one can buy such "frozen lightning" sculptures as artwork.

Lichtenberg enjoyed a certain amount of prestige and respect from his scientific peers while he lived. Alessandro Volta visited Göttingen in 1784 expressly to meet Lichtenberg and observe some of this experiments, and Karl Friedrich Gauss attended several of his lectures. His name is less well known today, but he would no doubt be gratified to find these eponymous fractal patterns still inspiring scientists and artists alike, nearly three centuries later.

Further reading:

Hashishes, Yuzo. (1979) "Two Hundred Years of Lichtenberg Figures," *Journal of Electrostatics*, 6(1), 1-13.

PLAN continued from page 5

Board in the spring of 2013. Once these recommendations are established, they will be available to the membership at large on the APS website. For more information, contact Darlene Logan at 301-209-3224 or logan@aps.org.

Early-Career Task Force Gears Up

APS has also established a Task Force on Early-Career Physicists, focusing on physicists in graduate school, postdoctoral appointments and first professional jobs.

At its first meeting on October 15, 2012, the Task Force focused on addressing the needs of an increasingly diverse membership of physicists working in careers beyond conventional academic research. "We want to extend what it means to be a physicist such that APS is inclusive of physicists across the disciplines," explained Task Force chairman Brad Conrad of Appalachian State University. "APS can be a resource for physicists throughout their careers, whether they are working as engineers, as researchers, or as financial analysts." The Task Force discussed ways of engaging this diverse body of early career physicists through stronger networking opportunities at the local, regional, and national levels, developing new mentoring programs, and new volunteer opportunities for APS members to start conversations about possible career paths.

This objective in the Strategic Plan is to help early-career physicists take their place in the physics enterprise, and to facilitate stronger connections of this group to the APS physics community. In addition to Conrad, the other Task Force members are: Greg Meisner, GM Global Research; Amber Stuver, LIGO, Louisiana State University; Tom Baer, Stanford University; Megan Comins, Cornell University; Meghan Anzelc, CNA, Commercial Insurance; Cynthia Aku-Leh, Iscience; Jesus Pando, DePaul University; and Heather Galloway, Texas State University.

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Rudolph's post echoed the fears of many physicists who avoid or limit posting to the arXiv during the submission process at premier academic journals, despite explicit journal policies that allow such practices. Emails obtained by *APS News* and conversations with *Nature* editors have revealed a muddled case that centers on the authors' follow-up preprint that initially surprised the journal's editors and some outside experts.

Adapting to Change

Since its creation 20 years ago, the arXiv preprint server (arXiv.org) has emerged as a primary source for many physicists seeking papers on cutting edge research in their field. Although arXiv preprints aren't truly peer-reviewed, researchers in some sub-disciplines frequently depend on the arXiv more than academic journals.

"I think putting things on the arXiv is much more important," said Matt Leifer, a quantum theorist at University College London. "More important than getting in a journal ever."

As the arXiv has become more influential, journals have adapted. *Physical Review Letters* and other APS journals don't have embargo policies, and APS permits authors to post preprints of submitted articles (see this month's Back Page for a comprehensive explication of APS policies). Embargo policies at *Nature* and *Science* explicitly allow authors to post preprints of submitted articles without penalty, provided the authors don't actively pursue press coverage.

"[The arXiv] caught us a little bit by surprise at the start," said Karl Ziemelis, Chief Physical Sciences Editor at *Nature*. "Quite rapidly, we came to appreciate that the preprint server provided a very valuable service."

Nature had no formal policy on preprints at first, but they ran a series of editorials over a decade ago that outlined their policy allowing the use of preprints, according to Ziemelis. Now, *Nature* lists this policy on several areas of its website.

Authors of papers in both *Nature* and *Science* may talk to members of the press one week before publication, however. Registered journalists are given access to upcoming papers and contact information for authors during this week under the condition that they don't publish news articles until the press embargo has passed.

Although both journals have clear policies in principle, confusion and apprehension persist among physicists. Some physicists worry that posting preprint articles or giving conference talks without "embargoing" the information for attending journalists may affect their chances of publication.

"More often than not, it's a fear that scientists have rather than the reality," said Ivan Oransky, a science journalist who runs the popular Embargo Watch blog.

A Tale of Two Preprints

Other researchers had told Rudolph that posting to the arXiv may not have been a good idea, but he thought those fears were largely unfounded. Furthermore, another pressing issue had arisen: Rudolph's colleagues had warned him that other groups may be posting similar research soon, effectively "scooping" their results. In November, he decided to post a preprint of the research conducted with his student, Matthew Pusey, and Barrett, under the title, "The Quantum State Cannot Be Interpreted Statistically."

"Ultimately, the research priority is determined by when it goes on the arXiv," said Rudolph.

Quickly, journalists picked up on the preprint. Rudolph, Barrett and Pusey declined to talk to the press per *Nature's* embargo policy. Nonetheless, *Nature News* published a popular science article covering the research in which several respected experts praised the new results. *Nature News* belongs to the same company as the journal *Nature*, but the two publications maintain an editorial firewall.

Pusey, Barrett, and Rudolph had shown that the quantum state is, in fact, physically real. In other words, the authors' argument suggested that there was no deeper theory underlying quantum mechanics. This result conflicted with "epistemic" or "statistical" interpretations of quantum mechanics that suggest wave functions merely reflect an observer's knowledge about a system. These "statistical" interpretations have enjoyed resurging popularity among some philosophers and physicists in the past couple of decades.

"It was certainly the biggest result in the foundations of quantum theory in the last 5 years," said Leifer. "That might be underestimating it."

Approximately three weeks after posting his preprint, Rudolph heard promising news from *Nature*: The referee reports were mostly positive, and the editors were accepting Rudolph's paper, in principle. A large majority of papers accepted in principle are eventually published. "In principle" acceptance, however, is a stage removed from formal acceptance.

The three authors then revised their article and sent it back to *Nature*'s editors. Meanwhile, Barrett and Rudolph posted another arXiv article with a cheeky, conflicting title: "The Quantum State Can Be Interpreted Statistically."

Although this second paper's title suggested a contradiction with the original results, the authors' intention was to explore a key assumption of the first paper –preparation independence. This principle asserts that it's possible to set up two experiments independently, say in different geographic locations at different labs, without any underlying super-correlations that would affect the results of both experiments.

"That assumption is essentially a bedrock assumption of science," said Rudolph. "Otherwise, there could always be the leprechauns tricking us hiding under our experiments."

The second paper aimed to strengthen the first paper by carefully examining this assumption mathematically. In the paper, the authors presented a technical counterexample under which this assumption was false. But they were not suggesting that this could be a plausible feature of the world, said Rudolph.

Rudolph wanted to post this follow-up article, which included authors who were not involved with the first paper, as soon as possible. In his field, priority is often given to arXiv posting dates, not publication dates in journals. *Nature's* policies require authors to notify them of any submitted research that may have a bearing on a submitted article, which Rudolph did not do.

In a matter of days, one referee alerted *Nature* to the second paper and expressed some concerns. When asked to comment, another referee expressed surprise but still supported publication of the original paper. Within a week of the second preprint's publication, *Nature* rejected the first paper without sharing these referees' comments on the second paper with the authors.

Rudolph appealed the decision in an email the next day. During the next two weeks, Karen Howell, *Nature*'s corresponding physical sciences editor for this manuscript, consulted again with the referee who alerted her to the paper. This referee had provided the "most detailed and thoughtful comments," throughout the review process, according to a written statement provided by Howell.

"The advice that we received from referee 3 was that the later work considerably weakened the findings of the original paper," Howell wrote in her statement.

In a follow-up rejection email, *Nature* reiterated their position, adding that one referee felt there was no justification for the preparation independence assumption. At the end of the email, Howell added an explanation on why publishing the paper "would not necessarily serve the wider interests of the community," according to her statement. This explanation was stated as an aside after the reasons for rejection were given, she said.

She added: "In this regard, I pointed out that the timeliness and impact of the *Nature* submission had been diminished following wide debate."

In light of this debate among scientists, the "take home" message of the original paper was becoming increasingly unclear, according to both Howell and Ziemelis. The evolving scientific debate facilitated by the authors' second preprint appeared to weaken the original paper's impact in the minds of *Nature's* editors.

Rudolph believes that *Nature* should have consulted more expert opinion to resolve any confusion, and that he and his colleagues should have been allowed to respond directly to the referees' comments on the second paper.

"I don't believe that referee 3 ever had opinions that the [original] paper should not be published because of paper two," said Rudolph. "And I have not seen any information to the contrary."

Rudolph admits that the second paper may have made some experts "uncomfortable" in the early days after publication, as intended. At subsequent conferences, however, no one has called the preparation independence assumption into question when considering serious physical theories, Rudolph added. Instead, discussions have addressed the way this assumption fits into other key assumptions in the philosophy of physics, he said.

In the end, the first paper was published in the less prominent *Nature Physics*. *Physical Review Letters* published the second paper.

Ingelfinger's Legacy

The Ingelfinger Rule, which stipulates that authors cannot publish the same paper in two different outlets, has led many scientists to be extra cautious. Originating in the 1960s, the rule's intention was to prevent publication of the same research in multiple scientific journals as a way to maintain originality.

The arXiv has complicated interpretations of this rule. Preprint servers have significantly accelerated publishing in physics, and top journals have tried to adapt.

In this particular case, *Nature's* editors concluded that the message of a submitted paper had changed in light of a new preprint. *Nature's* rejection did not appear to violate its own pre-publication embargo policy. Nonetheless, the case reveals the confusion and miscommunication that can arise amongst editors and physicists who use two different publishing platforms.

Many physicists still approach preprints differently than normal when submitting to high-end journals. Although this case won't affect how Rudolph uses the arXiv, he still sees this sentiment amongst many of his peers.

"They feel that they have to [act differently]," said Rudolph.

Oransky, the founder of the Embargo Watch blog, believes that these fears are typically unfounded, but the specter of the Ingelfinger Rule still exerts a strong influence on scientific publishing.

"Scientists often fear the so-called Ingelfinger Rule more than they have to, but it has a real chilling effect on the flow of scientific information," Oransky said in an email. "I'd love to see more open discussion of these issues, so if this sparks that in the future, I think that's a good thing."

ANNOUNCEMENTS

THE AMERICAN PHYSICAL SOCIETY is currently accepting applications for the Congressional Science Fellowship Program. Fellows serve one year on the staff of a senator, representative or congressional committee. They are afforded an opportunity to learn the legislative process and explore science policy issues from the lawmakers' perspective. In turn, Fellows have the opportunity to lend scientific and technical expertise to public policy issues.

QUALIFICATIONS include a PhD or equivalent in physics or a closely related field, a strong interest in science and technology policy and, ideally, some experience in applying scientific knowledge toward the solution of societal problems. Fellows are required to be members of the APS.

TERM OF APPOINTMENT is one year, beginning in September of 2013 with participation in a two week orientation sponsored by AAAS. Fellows have considerable choice in congressional assignments.

A STIPEND is offered in addition to allowances for relocation, in-service travel, and health insurance premiums.

APPLICATION should consist of a letter of intent of no more than 2-pages, a 2-page resume: with one additional page for publications, and three letters of reference.

All application materials must be submitted online by January 15, 2013 up til 5:00 pm. EST.

http://www.aps.org/policy/fellowships/congressional.cfm

Reviews of Modern Physics

From eV to EeV: Neutrino cross sections across energy scales

Joseph A. Formaggio and G.P. Zeller

Neutrinos have been important probes and ingredients of nuclear physics, elementary particle physics, astrophysics, and cosmology. Their interaction cross sections are vital for their own sake and also for understanding the signals and backgrounds associated with neutrino sources, production processes, oscillations, and other processes such as the search for proton decay. This review summarizes our knowledge of neutrino cross sections over energy scales ranging from very low energies up to the ultrahigh energies associated with astrophysical sources.

▶ **http://link.aps.org/doi/10.1103/RevModPhys.84.1307**

http://rmp.aps.org

Now accepting applications

India - U.S. 2013 Travel Grants

Physicists and physics graduate students in India and the United States can apply for travel grants to pursue opportunities in the other country.

The **APS-IUSSTF Professorship Awards in Physics** funds physicists in India or the U.S. wishing to visit overseas to teach short courses or provide a physics lecture series at a U.S. or Indian university. Awards are for up to U.S. $4,000.

Through the **APS-IUSSTF Physics Student Visitation Program**, U.S. and Indian graduate students may apply for travel funds of up to U.S. $3,000 to pursue opportunities in physics. Travel funds could be used to attend a short-course or summer institute, to work temporarily in a laboratory, for example. This program aims to mostly support graduate student travel to India by U.S. citizens, while enabling some students of Indian citizenship to travel to the United States.

APS physics

IUSSTF Indo-US Science and Technology Forum

This program is sponsored by the Indo-U.S. Science and Technology Forum (IUSSTF) and administered by the American Physical Society (APS).

Application deadline: Friday, 16 November 2012

Further details including proposal guidelines: www.aps.org/programs/international/us-india-travel.cfm

2013 BRAZIL-U.S. Exchange Program

Accepting Applications

The American Physical Society is now accepting applications from U.S. applicants for the Brazil-U.S. Exchange Program.

Through **the Brazil-U.S. Physics Student Visitation Program**, graduate students can apply for travel funds to pursue opportunities in physics, such as: 1) attending a short-course; 2) visiting with a professor in his/her field of study; 3) working temporarily in a lab; or 4) another opportunity that the student and host professor feel is worthy of travel support. Grants are for up to USD $3,000.

The Brazil-U.S. Professorship/Lectureship Program funds physicists in Brazil and the United States wishing to visit overseas to teach a short course or deliver a lecture series in the other country. Grants are for up to USD $4,000.

The application deadline for U.S. applicants traveling to Brazil is Friday, 16 November 2012. Applications from U.S. applicants should be submitted to Michele Irwin, APS Office of International Affairs, Irwin@aps.org. Additional information, including application guidelines, is provided at: **www.aps.org/programs/international/**

Information for Brazilian applicants is available from SBF: www.sbfisica.org.br/v1/

This program is sponsored by the Sociedade Brasileira de Física (SBF) and APS.

APS physics

SBF SOCIEDADE BRASILEIRA DE FÍSICA

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at the meeting, delivering a talk about the importance of science as an international endeavor.

"I think the fact that we had the first joint scientific session was very important," Heeger said. "I think this is a starting point for further engagement of APS with China and physics in China."

The delegation scheduled the trip to coincide with three major physics meetings in China. They attended the Shanghai International Summer School of Neutrinos and Dark Matter, the annual meeting of the CPS and the International Symposium of Neutrino Physics and Beyond at Daya Bay in Shenzhen province.

"These three happening concurrently provided a nice package of events to build a program around," Flatten said. "That created the opportunity to put together a larger trip and visit some universities as well."

The delegation visited five universities during the trip, including Nanjing University, Fudan University and Jiao Tong University in Shanghai, the Hong Kong University of Science and Technology and the Chinese University of Hong Kong.

"At each of the universities, we had productive discussions with the department chair, and often the dean," Kirby said. "We found, for instance, that there was a tremendous interest at one university in hearing more about physics education."

She added that many of the people they met had studied in the United States in some capacity and that many of them were already members of APS or even APS Fellows.

APS currently has 324 members living in China, 84 in Hong Kong and 259 in Taiwan. Heeger himself has been working in China on detecting neutrinos at Daya Bay. As China's international stature in science continues to grow, leaders in the physics community see lots of opportunity for more collaboration and cooperation between US physicists and those based in China.

"Publishing in APS journals is a really high priority for them," Kirby said, adding that there are many physicists in China interested in getting involved with refereeing papers. "They also value greatly the possibility of Fellowship … Those honors carry a lot of weight."

Part of the recently announced APS strategic plan is to foster more international collaboration. Within the next year, the Society is planning to set up a task force on international engagement to define more specifically how to institute such connections. Heeger said that he hopes that APS could set up an exchange program with China, akin to the ones already established with Brazil and India.

"I think it is a starting point for the development of a program with China," Heeger said. "And hopefully a starting point for APS to build a program with other countries in Asia."

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bership Trish Lettieri who helped him find people to draft the proposed section's bylaws and email potential members.

Physicists in the Mid-Atlantic region received an email on June 4 asking if they would be interested in joining a new section. When the section's Organizing Committee met 19 days later to draft their bylaws, they had received more than 250 electronic signatures, passing the 200 signature threshold to prompt a Council vote.

The Mid-Atlantic States have been without their own section in part because there are so many research centers and society headquarters in the region. For many years in APS history, the March and April meetings were both held in the region.

"There's such a dense population of our members in this area and other opportunities for networking and collaborating there was never a grass roots movement to get [a section] started," Lettieri said. "No one ever took the initiative to start it because there were other avenues of collaboration."

Sectional meetings have long been popular with researchers with small travel budgets.

"It will benefit the students in the area to give them the same opportunity as the rest of the country," Lettieri said. She added that section meetings are often the first meetings where undergraduate students present research, in part because of the low travel costs associated with a close-by meeting.

The organizing committee is gearing up to recruit new members. Next year's March Meeting will be in Baltimore, and the committee is planning a reception there to raise awareness and attract more local physicists to its ranks.

"We want to get the section up and running, and get more members," Schlamminger said. "I think it will be a good opportunity to connect scientists and carry out the APS mission in a small region."

If all goes according to plan, the new section will elect its officers in 2013, and will host its first meeting in the Fall of 2014, likely at Penn State University.

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The Back Page

APS and the Challenge of Open Access

By Joseph Serene and Gene Sprouse

Joseph Serene

Gene Sprouse

As many readers of *APS News* will realize, APS has just completed a major strategic planning exercise. Not surprisingly, a significant component of that exercise concerned challenges facing the Society, and Open Access to the APS journals held a prominent spot among those challenges.

We believe that APS has a well thought out approach to the challenges and opportunities presented by Open Access. Though our approach continues to evolve in response to new developments, it grows from a consistent core of both philosophy and practice reaching back at least fifteen years. Nevertheless, discussions surrounding the development and implementation of the APS Strategic Plan have made us keenly aware that relatively few members of APS know our policies on Open Access or the fundamental principles underlying and guiding them.

This article aims to provide an overview of the policies, practices, philosophy, and plans of APS regarding Open Access. As an introduction to what follows, we offer the following "elevator speech" summary: (1) APS supports the principle of Open Access to its journals to the fullest extent consistent with financial stability; (2) peer-reviewed journals continue to be essential to scientific research; (3) high-quality peer-reviewed journals have significant, irreducible costs; (4) the leading approaches to Open Access all carry both promise and potential problems; (5) Open Access is a thoroughly international issue, which brings both complications and stability.

In November 2009 the APS Council adopted a formal policy statement on Open Access:

The APS supports the principles of Open Access to the maximum extent possible that allows the Society to maintain peer-reviewed high-quality journals, secure archiving, and the Society's long-term financial stability, to the benefit of the scientific enterprise.

This statement codifies our previous practices and informs and guides our ongoing policy decisions.

The current broad-based focus on Open Access grows from two roots: (1) a sincere public interest in access to the medical research literature, and (2) severe pressure on the acquisitions budgets of research libraries, in large part due to the pricing policies of a few dominant commercial publishers. One can argue about the in-principle relevance of each of these to physics and to society publishers such as APS, but as a practical matter they set the stage on which we must play.

Public discussions of Open Access sometimes assert that traditional peer-reviewed journals are no longer needed in the age of the World Wide Web or that even if they were needed, they should cost very little to produce, since referees donate their time and effort. These claims are seriously in error.

Peer-reviewed journals are, if anything, even more essential in our Internet-enabled environment. In an era in which a vast amount of un-refereed scientific literature is freely available on the web, refereed journals take on special importance and their publishers perform critical services. The peer review system identifies subsets of the open literature that relevant scientific communities have singled out as sound, significant, and worthy of dissemination and preservation, and improves the papers selected for publication. The importance of peer review is enhanced by the growth of interdisciplinary research and extends not only to the scientific community, but even more so to the general public, whose members have no other basis for discriminating reliable science from bogus claims. This is most apparent for the medical literature, but closer to home, examples such as climate change come readily to mind.

Innovations such as post-publication commenting have not yet justified the high expectations surrounding their introduction. The true experts whose comments would be needed are too busy to read and comment on numerous papers of widely varying quality, and such systems are notoriously prone to gaming.

In addition to managing peer review, publishers provide copyediting and full-text electronic formatting (currently in XML) facilitating electronic linking of references and sophisticated search capabilities; secure archiving; and well-designed, stable online platforms providing seamless access to a significant fraction of the literature. APS provides online access to everything ever published in the *Physical Review* family of journals, back to 1893, a total of approximately 500,000 papers.

Peer-reviewed scientific journals represent a remarkable cooperative activity of the international scientific community, and an appreciation for the scale of this activity is essential background for discussions of Open Access. APS publishes ten peer-reviewed journals, which in 2011 received approximately 35,000 submissions. We eventually published 19,000 of these, with the help of 25,000 volunteer peer reviewers.

Roughly 22% of the submissions, 27% of the published papers, and 33% of the referees came from the US. Physics publishing is a thoroughly international enterprise.

In spite of the major contributions from volunteer referees, peer-reviewed journals on the scale of ours are still expensive to produce. For example, the APS editorial office has a staff of 150, including 50 full-time PhD editors, maintains three geographically distributed, fully-mirrored data centers, and provides approximately 16,000,000 full-text downloads of papers every year. We have taken major strides to reduce expenses, such as moving to all-electronic operations and transferring our XML composition and copy editing to highly efficient vendors, but excellent editors and editorial support staff, an outstanding IT group, and the physical infrastructure to support them form the core of our publishing operations and generate expenses that come to nearly $30M per year.

These costs are now covered (primarily) by subscriptions from libraries in universities, colleges, and research organizations. Although this provides access to APS journals for a very large fraction of active researchers, it does not cover members of the general public, whose taxes help to support scientific research all over the world. It can also present barriers for researchers at smaller educational institutions and at small high-tech companies, even though APS uses a tiered subscription pricing system, with prices keyed to an institution's level of research activity and journal usage, and a factor of approximately 2.5 between prices for the top and bottom tiers.

Gold Open Access-what does it mean?

The simplest method to provide universal access is so-called Gold Open Access, in which authors (or their institutions or funders) pay an Article Processing Charge (APC) to make an article Open Access, either in a purely OA journal (such as our *Physical Review X* and *Physical Review Special Topics–Physics Education Research*) or a hybrid journal where only some papers are OA. *Physical Review A-E* and *Physical Review Letters* are all hybrid journals in this sense. *Physical Review Special Topics–Accelerators and Beams* is a less-usual variation on the Gold theme (but one of the oldest Gold OA journals, dating from 1998), with APCs replaced by contributions from accelerator laboratories.

Our current APCs , providing Open Access with a Creative Commons CC-BY license, are $1700 for *PRA-E* and *PRST–PER* ($1000 for short papers), $1500 for *PRX*, and $2700 for *PRL*. These fees are set so that they would at least replace the current subscription revenue if all authors chose the OA option. The charge to publish in *PRL* is significantly higher because of its significantly lower acceptance rate and associated editorial expenses. Although selective, well-refereed journals from different publishers differ in details of editorial and business models, their APCs are remarkably similar; publication expenses are real and essential for high-quality journals.

At first glance Gold Open Access, with hybrid journals as a transitional step, looks like the best approach from a publisher's perspective, because it simply replaces one revenue stream by another. But Gold OA raises a number of short-term and long-term concerns. One might think that the money now spent by libraries for subscriptions could be redirected to pay APCs, but this fails because many subscribing institutions contribute very few papers. Furthermore, if a single country opts to pay for Gold OA, as the UK has recently done, due to the broad international author and subscription base it cannot expect to recover its APCs from reduced subscriptions fees for hybrid journals (even if publishers are scrupulously fair in reducing subscription fees).

These observations mean that a large fraction of APCs would come from a relatively small number of major research institutions and from research funds provided by national or international funding agencies such as DOE and NSF, which would in turn reduce the funding available for equipment and supplies, support of graduate students and postdocs, etc. These charges against research grants at research-intensive universities producing many papers would be significant, and far larger than their current subscription fees. The Gold path to Open Access may ultimately be the best, but one must realize that following it will effectively redirect some fraction of current research funding to APCs.

The SCOAP3 initiative, which aims to make most of the High Energy Physics literature Gold OA, attempts to circumvent these problems by convincing the entire international community of libraries with HEP journal subscriptions to make an instantaneous transition, by redirecting all of their HEP subscription funds to CERN, for subsequent distribution to publishers for pre-set APCs. The model has its own start-up challenges and long-run stability issues, but APS is following the project with intense interest and engagement, and will participate if the funding materializes.

Mandated Gold OA could also drive some papers to lighter-reviewed but less expensive journals, for example when an investigator's funds were running short and she or he had to choose between supporting a graduate student and publishing in a higher-quality journal. Finally, we worry about having large parts of our revenue tied to a small number of government agencies, all over the world, because of potential unpredictable shifts in the national budgets for these agencies. Our widely diversified set of library customers brings an element of stability, even though keeping track of them can be an administrative burden.

The UK government, acting on the recommendation of a distinguished government commission (the Finch Commission), including librarians, publishers, and scholars, very recently adopted Gold (including hybrid) OA as the immediate goal for all UK government funded papers (with the Green options discussed immediately below as acceptable fallbacks), and provided significant funding to help enable this transition. APS journals already provide all of the acceptable options under this policy.

Green Open Access-availability somewhere on the Internet

The other possibilities for ensuring broad public access, and the ones that we favor at present, fall under the (large) umbrella of Green Open Access. One can think of this as encompassing all forms of public access other than complete Open Access to the publisher's Version of Record on a journal platform. For example, APS allows authors to post our final PDF of their paper on their own websites or their institution's websites (i.e., in institutional repositories), and we allow the author's versions of the paper, including revisions resulting from the peer review process, to be posted on any free site at any time, without embargoes. We were the first publisher to adopt such a policy, in 1997, in support of arXiv.org (then xxx.lanl.gov) in its early years. We also offer our entire journal collection and archive to any US public library or high school library for walk-in access, at no charge (an idea borrowed by the UK), and we offer a low-cost article rental option for all of our articles through DeepDyve (a commercial venture). We note in passing that the use (to date) of these opportunities has been very low, at least suggesting that the actual public demand for research papers in physics is not large.

We believe that extending these approaches could provide acceptable public access at a relatively low cost to funding agencies and relatively low risk to publishers. For example, funding agencies could require that a final version of any paper that they support must be either (1) posted on an author's website or an institutional website; (2) posted on an Open Access repository such as arXiv; or (3) published Open Access in a Gold or hybrid journal. This is essentially the recent UK/Finch policy, with less bias toward the Gold option.

In conclusion, although no one knows the precise trajectory of Open Access, the APS journals are long-time participants and are positioned to respond and to lead as needed.

Joseph Serene is Treasurer/Publisher of the APS. Gene Sprouse is APS Editor in Chief.

APS News welcomes and encourages letters and submissions from its members responding to these and other issues. Responses may be sent to: letters@aps.org